



FELLOWSHIP REPORT

Summary of work activities

Iulia Adelina Turiac

Intervention Epidemiology path (EPIET)

Cohort 2015

Background

The ECDC Fellowship Training Programme includes two distinct curricular pathways: Intervention Epidemiology Training (EPIET) and Public Health Microbiology Training (EUPHEM). After the two-year training EPIET and EUPHEM graduates are considered experts in applying epidemiological or microbiological methods to provide evidence to guide public health interventions for communicable disease prevention and control.

Both curriculum paths are part of the ECDC fellowship programme that provides competency based training and practical experience using the 'learning by doing' approach in acknowledged training sites across the European Union (EU) and European Economic Area (EEA) Member States.

Intervention Epidemiology path (EPIET)

Field epidemiology aims to apply epidemiologic methods in day to day public health field conditions in order to generate new knowledge and scientific evidence for public health decision making. The context is often complex and difficult to control, which challenges study design and interpretation of study results. However, often in Public Health we lack the opportunity to perform controlled trials and we are faced with the need to design observational studies as best as we can. Field epidemiologists use epidemiology as a tool to design, evaluate or improve interventions to protect the health of a population.

The European Programme for Intervention Epidemiology Training (EPIET) was created in 1995. Its purpose is to create a network of highly trained field epidemiologists in the European Union, thereby strengthening the public health epidemiology workforce at Member State and EU/EEA level. Current EPIET alumni are providing expertise in response activities and strengthening capacity for communicable disease surveillance and control inside and beyond the EU. In 2006 EPIET was integrated into the core activities of ECDC.

The objectives of the ECDC Fellowship - EPIET path are:

To strengthen the surveillance of infectious diseases and other public health issues in Member States and at EU level;

To develop response capacity for effective field investigation and control at national and community level to meet public health threats;

To develop a European network of public health epidemiologists who use standard methods and share common objectives;

The views expressed in this publication do not necessarily reflect the views of the European Centre for Disease Prevention and Control (ECDC).

This portfolio does not represent a diploma. Fellows receive a certificate acknowledging the 2-year training and listing the theoretical modules attended. Additionally, if all training objectives have been met, they receive a diploma.

Stockholm, July 2016

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To contribute to the development of the community network for the surveillance and control of communicable diseases.

Fellows develop core competencies in field epidemiology mainly through project or activity work, but also partly through participation in training modules. Outputs are presented in accordance with the EPIET competency domains, as set out in the EPIET scientific guide¹.

Pre-fellowship short biography

Iulia graduated from the University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca as a veterinary doctor in 2005. She received a PhD in Infectious Diseases from the same University, in 2011. Prior EPIET, starting 2006 she worked as a veterinary counsellor in the Central Epidemiological Unit and Animal Health Department of the National Sanitary Veterinary and Food Safety Authority of Romania. From November 2013- May 2014 she gained international experience working as a Consultant-Short Time Professional (Component manager) at EuFMD Commission of Food and Agriculture Organization of United Nations (FAO), Rome, Italy.

Fellowship assignment: Intervention Epidemiology path (EPIET)

In September 2015, Iulia started her EPIET fellowship as an EU-track fellow based at the Department of Medical and Surgery Science, Faculty of Medicine from the University of Foggia, Italy, under the supervision of Domenico Martinelli. Her EPIET frontline coordinator was Dr. Alicia Barrasa. This report summarizes the work performed during the fellowship.

Fellowship portfolio

This portfolio presents a summary of all work activities (unless restricted due to confidentiality regulations) conducted by the fellow during the ECDC Fellowship, EPIET path. These activities include various projects, and theoretical training modules.

Projects included epidemiological contributions to public health event detection and investigation (surveillance and outbreaks); applied epidemiology field research; teaching epidemiology; summarising and communicating scientific evidence and activities with a specific epidemiology focus. The outcomes include publications, presentations, posters, reports and teaching materials prepared by the fellow.

This portfolio also includes a reflection from the fellow on the field epidemiology competencies developed during the 2-year training, a reflection from the supervisor on the added value of engaging in the training of the fellow, as well as a reflection by the programme coordinator on the development of the fellow's competencies.

Fellowship projects

1. Surveillance

Active case finding, following the ascertainment of West Nile Virus infection in equines in province of Lecce, Apulia Region, Italy, October - November 2015

West Nile Virus (WNV) is maintained in a mosquito–bird–mosquito transmission cycle, whereas humans and horses are considered dead-end hosts. Most human infections occur by natural transmission from mosquitoes and are completely asymptomatic; about 20% of those infected develop a febrile illness; in less than 1% of cases, the disease manifests as a neuro-invasive disease (usually encephalitis, meningoencephalitis or flaccid paralysis).

On 30th of October 2015, the Italian National Blood Centre of the National Public Health Institute alerted the Apulian Regional Health Authorities, on the identification of a WNV infection in equines, in Province of Lecce, Apulia region. Due to this event a retrospective and a prospective WNV case-finding was conducted in the province of Lecce. For the retrospective WNV cases-finding were extracted all the admission records from October 2015, with at least one of the following 2007 ICD9-CM codes in the discharge diagnosis field: (049.x, 062.x, 066.4x, 139.0, 321.2, 322.x, 323.xx, 336.9, 341.xx, 344.xx, 357.x and 781.3) of the Emergency Department (ED) database of Lecce's Local Health Units.

The prospective WNV cases-finding was performed in November 2015, searching for WNV possible cases using the Italian case definition, a modified European case definition of West Nile Fever. On weekly basis, all Departments of

¹ European Centre for Disease Prevention and Control. European public health training programme. Stockholm: ECDC; 2013. Available from: http://ecdc.europa.eu/en/epiet/Documents/Scientific%20guides/EPIET%20Scientific%20Guide_C2016.pdf

Infectious Diseases, Neurology, Internal Medicine and Intensive Care, from Lecce province, were telephonically contacted to inquire whether they have had hospitalized patients with a neurological symptoms suggestive to WNF in the previous 7 days.

For the retrospective case finding were analysed 15.864 admission records had in October 2015 by the six ED of Lecce province. Further were investigated four patients that had at least one neurological symptom but none reported or presented fever during physical examination, which is a key symptom in classification of cases; therefore, none met the definition requirements of "possible WNF case". In addition, the prospective case finding revealed no WNF possible cases in province of Lecce.

In conclusion, the performed surveillance revealed no transmission of WNV from animals to humans. In the absence of an effective human vaccine, WNV surveillance and collaboration between veterinary and human health authorities continues to be crucial for monitoring WNV activity and targeting prevention and control activities.

Role and outputs: co-investigator

Performed the weekly active surveillance by liaising with the 20 involved departments from Lecce province, collaborated in data analysis and writing the final report (1).

Supervisor: Domenico Martinelli

Competencies developed:

Performing this surveillance activity I become aware of the procedure in which active surveillance for WNF is performed in Italy, surveillance data management and the importance of effective collaboration between veterinarians and health care providers essential in protecting public health.

Evaluation of the Italian integrated measles and rubella surveillance system in Apulia region, three years after its introduction

As recommended by WHO Plan for measles and rubella elimination, an integrated measles and rubella surveillance system (IMRSS) was established in 2013, in Italy. We assessed a set of performance indicators of IMRSS, three years after its implementation in Apulia.

We extracted data on suspected measles and rubella cases reported to IMRSS from 1st January 2013 to 30th of June 2016. We estimated system sensitivity in detecting suspected cases using the capture-recapture method for three data-sources (IMRSS, routine notification system and hospitalisations); the log-linear model with the lowest Akaike Information Criterion was selected. We used indicators and targets provided by WHO surveillance performance protocol and ECDC evaluation guidelines to calculate the rate of suspected cases with laboratory investigation, the origin of infection and the positive predicted value (PPV). Data quality was described as the completeness of variables and timeliness of reporting as median time interval between the local alert to regional reporting.

Four rubella and 127 measles suspected cases were reported to IMRSS. Due to the low number of rubella cases and no laboratory confirmed cases, we focused our analysis on measles. Of 127 suspected cases, 82 were laboratory confirmed. IMRSS sensitivity was 82% (95%CI: 75-87). Completeness was >98% for mandatory variables (date of onset, date of reporting, date of birth, place of residence, sex, outcome, outbreak and travel history). Incomplete variables were in the area of laboratory diagnosis, with 57% (95%CI: 48-66) for genotyping, 67% (95%CI: 58-75) for laboratory results of serologic test and 76% (95%CI: 68-83) for sampling date. The median time interval between the local alert to regional reporting was three days; 35% of cases were reported ≤24h. The rate of laboratory investigation was 77%. Origin of infection was identified for 85% of cases and PPV was 64.5%.

The Apulian IMRSS has good sensitivity, provides quality data and meets the WHO targets according to WHO plan for eliminating measles and rubella. Sustained efforts should be made to improve timeliness, completeness of laboratory related variables and PPV of IMRSS by raising awareness amongst the Local Public Health Authorities of its importance in achieving the elimination goals.

Role and outputs: Principal investigator

Wrote the protocol, performed the data cleaning and data analysis, wrote the final report to be send to the stakeholders, and wrote a manuscript submitted to a peer-reviewed journal. The abstract was accepted for poster presentation at ESCAIDE 2017 (2).

Supervisor: Domenico Martinelli

Further activities: A manuscript was submitted to a peer-reviewed journal, *Epidemiology and Infection*.

Competencies developed: Working on this exciting surveillance project I became acquainted with the IMRSS, how it is set up and how it can be evaluated, become aware of the importance and necessity of evaluating a disease surveillance system; the complexity of different approaches in evaluating a surveillance system, especially for diseases of high importance and in the phase of elimination as measles and rubella. Also, I realized the research opportunities that arise by linking databases, which I used to calculate the sensitivity of the surveillance system.

Effectiveness of acellular pertussis vaccination in children twenty years after its introduction in Italy

In Italy, acellular pertussis vaccines replaced whole cell vaccines in 1995. Since 1999, National Vaccination Plan has recommended routine use of acellular vaccines in infants with the 2+1 schedule at 3-5-12 months, and a booster dose at 5-6 years. Since 2012, a booster for teens was also recommended. This study aimed at estimating acellular vaccines effectiveness (VE) in preventing pertussis of any severity and severe hospitalized cases in children ≤ 12 years in Apulia region ($\approx 4,000,000$ inhabitants), Italy.

A population-based retrospective study was conducted by linking mandatory notifications and hospital registrations for pertussis to obtain cases occurred from 2008 to 2013. VE for 3 and 4 doses was estimated using the screening method, where the proportion of the population vaccinated (PPV) was the vaccination coverage in children aged 1-4 years and 7-12 years, and the proportion of cases vaccinated (PCV) among notified or hospitalized cases was the proportion of subjects vaccinated ≥ 30 days before the disease onset or the hospital admission, respectively.

Seventy-three cases aged 1-4 years (79% hospitalized) and 78 cases aged 7-12 years (77% hospitalized) were recorded during 2008-2013 and included in VE estimation. PPV was 96.7% among children aged 1-4 years and 90% among those aged 7-12 years. PCV was 72.6% and 64.1% in the two groups, respectively. Three-dose VE against pertussis of any severity and severe hospitalized disease was 88.7% (95%CI: 80.9 to 93.3) and 88.9% (95%CI: 79.6 to 93.8), respectively. Four-dose VE against pertussis of any severity and severe hospitalizations was 81.8% (95%CI: 70.6 to 88.7) and 81.3% (95%CI: 67.7 to 89.2), respectively.

Acellular pertussis vaccines showed good effectiveness within the first years of life, protection partially waned as age increased. Improving booster uptake at 5-6 years visit is strongly recommended.

Role and outputs: co-investigator

Collaborated in interpreting the results, writing the abstract for ESCAIDE 2016 and writing the final paper (3). The results of this project were presented as a poster at ESCAIDE 2016 by Francesca Fortunato.

Supervisor: *Francesca Fortunato*

Further activities: We are planning to submit a manuscript to a peer-reviewed journal in the near future.

Competencies developed:

My involvement in this project gave me the opportunity to gain more knowledge about vaccines, vaccination strategy in Italy and learn how to calculate and interpret data on vaccine effectiveness.

Progress of the notified vaccine preventable diseases: hepatitis A, hepatitis B, measles, rubella, pertussis, varicella, mumps, and meningococcal meningitis in Apulia region, 1996-2015.

This report shows an insight of the progress of notification, over time, of several vaccine preventable disease such as: hepatitis A and B, mumps, rubella, measles, pertussis, meningococcal meningitis and varicella for which are being implemented specific operational strategies specified in the Vaccine Regional Plan 2016-2018 and in the Vaccine Calendar for 2017.

The 20 years (1996 - 2015), time-series descriptive analysis was produced using data extracted from the National Disease Surveillance System (SIMI) and Edotto. Data on Apulian population assigned to each Local Public Health Authority was taken from the National Institute of Statistics (ISTAT) website.

Role and outputs: principal investigator

Analysed the surveillance data, and wrote the final report in the format of graphs and tables as requested by the Apulian Regional Observatory for Epidemiology (4).

Supervisor: *Domenico Martinelli*

Competencies developed:

My involvement in this project gave me the opportunity to gain more knowledge in conducting surveillance data management, performing descriptive analysis of surveillance systems and have an insight of the epidemiological situation of some of the vaccines preventable diseases in Apulia region, Italy.

Rapid Risk Assessment - Hepatitis A cases amongst MSM in Apulia region, January – March – June 2017

Starting June 2016 an unusual increase in cases of hepatitis A affecting mainly men who have sex with men (MSM) has been reported by low endemicity countries in the European Region (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, and the United Kingdom) and also in Italy including Apulia region.

Apulia has long been classified as an intermediate endemic region for hepatitis A, after the major epidemic event in the two-year period 1996-1997 with more than 11,000 cases reported, annual incidence of about 130 per 100,000 inhabitants. Due to the international, national and regional increase of hepatitis A cases, a rapid risk assessment was conducted at the regional level. This event is of particular concern from a public health perspective because of the current limited availability of hepatitis A vaccine in Italy and worldwide.

In the region, from 1 January to 3 June 2017 were reported 251 cases of hepatitis A with 73 % in males, 77% of them with ages from 31 to 50 years old. Twenty cases reported having sexual intercourse with other men in the 8 weeks prior to the onset of the symptoms. The viral genomic sequence of 86 cases were highly correlated and directly attributable to the virus responsible for epidemic outbreaks between MSM in Europe and Italy.

Although, at present, there are no particular risk conditions for a recurrence of disease in the general population, there is a risk of disease diffusion into the community of MSM in Apulia region. The most effective prevention measures are surveillance, case healthcare and vaccination of close contacts (including sexual partners) of probable and confirmed cases of hepatitis A. Preventive vaccination is strongly recommended in HIV +, HBV + and HCV + affected or other sexually transmitted diseases and MSMs.

Role and outputs: co-investigator

Made a literature review, contributed to the descriptive epidemiology of hepatitis A and identification of risk factors in Apulia region using the surveillance data from 1996-2015 and reviewed the draft paper. The risk assessment was published on the Apulian Regional Observatory for Epidemiology (ROE) website in March (January-March) and updated in August 2017 (January-June) (5). An abstract was accepted as poster at the 50 National Congress of the Italian Society of Hygiene, Turin, 22-25 November, Italy (10).

Supervisor: Domenico Martinelli

Competencies developed: Being involved in this project I realized the importance and variety of uses of the surveillance data providing the quantitative information needed for risk assessment, setting priorities and establishing rational health policy and creating public health intervention. Also, I apprehended that the effective dissemination of information and active communication amongst different Member States are as important as data collection and analysis in order identify threats and achieve the goals for improving health status of general population worldwide.

Surveillance of community acquired pneumonia in Apulia region, 2013-2015

In recent years, some Italian regions, including Apulia, have recommended 13-valent conjugate vaccine (PCV13) to adults with underlying diseases and to the elderly. We aimed to conduct a post-licensure study to assess the effectiveness (VE) of PCV13 against pneumococcal community-acquired pneumonia (CAP) among adults aged ≥ 65 years.

From January 2013 until January 2015, a two-year prospective cohort surveillance on adults with CAP was conducted in the Apulia region, where the average vaccine uptake of PCV13 was 32% among adults ≥ 65 years. Surveillance for suspected CAP was conducted by 15 general practitioners, providing primary care for a total of 5,010 persons. VE in patients managed in the community was measured using a matched case-control design. VE was calculated as one minus the OR times 100%.

The overall VE against disease due to any pneumococcal strain was 88.1% (95% CI: 4.2 to 98.5), and 91.7% (95% CI: 13.1 to 99.2) when we controlled for underlying conditions.

Additional studies are needed to confirm direct PCV13 benefits.

Role and outputs: co-investigator

C collaborated in building up the database of patients enrolled in the study from the forms sent by the general practitioners

Supervisor: *Domenico Martinelli*

Competencies developed: being involved in building up the database for this study I acknowledge the importance of a well-structured standardised form to collect the data and how meaningful is the engagement of the general practitioners in providing good quality data.

2. Outbreak investigations

A Trichinellosis outbreak due to wild boar meat consumption in southern Italy, February –March 2016

An outbreak of Trichinellosis took place in southern Italy, Manfredonia city, situated in the Gargano National Park, where currently only the sylvatic cycle of *Trichinella* spp. is present and poaching is a common practice. On 25 January 2016, a 36 year-old hunter (index case) was admitted to the hospital in San Giovanni Rotondo city, with fever (temperature 40–41 °C), myalgia, facial and periorbital swelling, diarrhoea, vomiting, abdominal pain and night sweating. These symptoms were developed 20 days before hospitalisation. Laboratory analysis showed marked eosinophilia (42%) and increased CPK (472 UI/l). The patient reported that his wife and son had similar symptoms after having eaten together wild boar meat derived from a hunting trip held in December 2015.

Active case finding was conducted between February and May 2016 by the Foggia local public health authority. Intensive efforts were made by the public health-care providers to obtain information from the hospitalized case on the identity of other persons who eat or received meat from the incriminated wild boar.

During the epidemiological investigation other 4 laboratory confirmed cases and twenty-five persons reported having eaten wild boar meat as raw dried homemade sausages. *Trichinella britovi* larvae were detected in two samples of leftover sausages by the EURL for Parasites at the National Public Health Institute, Rome, Italy. The source of infection was meat from infected wild boars that were illegally hunted and, hence, not submitted to post-mortem veterinary inspection.

As the illegal nature of poaching makes veterinary control impossible, the cultural habit of consuming raw or undercooked meat continues to be the primary risk factor for acquiring Trichinellosis. Hunters and wild game meat consumers need to be educated about the risk for Trichinellosis and the importance of proper handling and cooking game meat. In addition, it is necessary continually raising the awareness on the epidemiological and clinical features of this zoonosis among healthcare personnel for an immediately suspicion of the disease.

Role and outputs: *principal investigator (UNIFG) co-investigator (for the outbreak)*

Proposed the trawling questionnaire used for case finding, build the database with the data collected during interviews, performed data analysis, described the outbreak in terms of time, place and person and wrote the final report (9). The outcomes of this outbreak investigation were presented as an oral presentation at the 49 National Conference of the Italian Society of Hygiene, at the "last minute" session (6). A letter to the editor was published in the Parasites and Vectors Journal (7).

Supervisor: *Domenico Martinelli and Francesca Fortunato*

Competencies developed:

Being involved in this outbreak investigation I learned how to perform some of the steps of an outbreak investigation applying the knowledge I gained through the EPIET outbreak module. In addition, I learnt about the concepts of a cohort study in an outbreak setting and the importance of the time and the way in which the interviews (data collection) are conducted and how challenging the data analysis can be due to data quality. I became aware of the importance of the cooperation between veterinary and human public health authorities to rapidly identify the source of the outbreak.

3. Applied epidemiology research

Retrospective analysis of national hospitalizations records for Herpes Zoster and its economic burden in Italy, 2001-2012

Herpes zoster (HZ) is a painful infectious disease caused by the reactivation of varicella-zoster virus. It mainly affects the elderly, and frequent complications include post-herpetic-neuralgia (PHN) and ophthalmic complications (OC). Considering the upcoming introduction of HZ vaccination programme nationwide we assessed the burden of hospitalization for HZ, its complications and direct costs related to hospitalized cases in Italy, in order to provide more complete data for national estimates.

We conducted a retrospective study on 2001-2012 data from the Italian Hospital Discharge Registry, where HZ is identified by ICD9-CM codes 053.xx as main or secondary diagnosis. We described number of cases and mean length of hospital stay (mLoS), comorbidities, and hospitalization rates for HZ x100,000 residents, stratified by year, sex, and age (0-49, 50-59, 60-69, 70-79 and ≥80); proportion of admission presenting one of more ICD9-CM codes related to an immunodeficiency condition and the total direct cost and average cost per admission for HZ in main or secondary diagnosis and its complications (PHN) and (OC).

A total of 44,948 discharges with HZ codes as main diagnosis (54% females, 82% ≥50yrs old, 7.8 days mLoS) and 3,613 discharges with an HZ code as secondary diagnosis (55.6% female, 85.7% ≥50 years old, 13.5 days mLoS) were reported. Annual rates decreased from 9.6 in 2001 to 3.9 X 100,000 in 2012 for HZ as main diagnosis, and from 1.4 and 1.6 in 2001 to 0.8 X 100,000 and 0.6 X 100,000 in 2012 for PHN and OC, respectively. We observed an increased trend of admissions presenting one of more ICD9-CM codes related to an immunodeficiency condition, from 8.9% in 2001 to 11.2% in 2012.

For the period, the overall direct cost was about 121M€; the mean cost of hospitalization for HZ as main diagnosis: was 2,695 € and for HZ as secondary diagnosis: 3,643 €. For PHN, the mean cost of hospitalization was 2,327 €, with a decreased trend from 2,370 € in 2001 to 2,146 € in 2012 and for OC was 2,047 €. HZ as secondary diagnosis was associated with higher average cost (3,918€ in 2012).

Despite the decreasing case numbers, our study confirmed a considerable disease and economic burden of HZ in elderly, supporting the introduction of vaccination programme for this group and other risk categories. These data could provide a baseline for monitoring the economic impact of the vaccination programme.

Role and outputs: *co-investigator*

Collaborated in writing the protocol, in data analysis and writing the manuscript to be submitted to a peer-reviewed journal. The results were presented as a poster at ESCAIDE 2016 (8).

Supervisor: *Domenico Martinelli*

Further activities: We are planning to submit the manuscript to a peer-reviewed journal in the next months

Competencies developed:

Being involved in this exciting research project I had the opportunity to use the STATA skills developed during the modules and also learned to use, for the first time, the analysis of variance (ANOVA). This project helped me expanding my knowledge regarding herpes zoster and through it I got acquainted for the first time with the working mechanism of the Italian health system.

Severity of hepatitis A presentation overtime in EU/EEA, 1997-2013

This project is part of the "European project on severity of Hepatitis A in EU/EEA, 1997-2013". Here only the Italian data (2001-2013) are presented.

The proportion of symptomatic hepatitis A virus (HAV) infections increases with age with children below 10 years of age often asymptomatic. One indicator of hepatitis A illness severity is whether persons are hospitalized. Also the severity of hepatitis A symptoms increases with age. The case-fatality ratio is generally low (0.1 to 0.3%) but can be higher (1.8%) in adults over 50 years of age or persons with underlying chronic liver disease. The study aimed to analyse the characteristics of hospitalisations associated with hepatitis A in Italy from 2001-2013 and to investigate possible changes in the severity of the presentation of hepatitis A over time.

A retrospective cohort study was designed to meet the study objectives. Study population: patients hospitalised in Italy during the period 2001-2013. Patients were identified through the collection of hospital discharge forms and extracted on the basis of the following ICD-9 codes: Hepatitis A without hepatic coma - 070.1; Hepatitis A with hepatic coma - 070.0. Both patients with hepatitis A as primary or secondary diagnosis were selected for the study. Poisson regression was used to model the variation in the proportion of severe hospitalisations out of all patients over the study period by year.

Between 2001 and 2013, in Italy were 28,945 hospitalized cases, 67% were male. Seventy three percent (21,098 cases) were primary diagnosis, 294 cases developed hepatic coma, 12 cases needed a liver transplant and approximate 7% (1,382 cases) had as co-morbidities other liver diseases. The most affected age group was the 18-39 years (11,359; 54%), followed by the 0-17 age group (4,595 cases; 22%) and the 40-64 age group (4,354

cases;21%). There were 12,101 severe cases (57%) where 11,974 cases had a hospital stay longer than 7 days. Median hospital length of stay was 8 days (IQR: 5-13 days). A strong statistical increase in the median age of severe cases was observed through the years, from 25 years old in 2001 to 36 years old in 2013 (p-value<0.001). In Italy, the hospitalisation rates, including severe hospitalisations, decreased over the study period while the median age of admission has increased during the study period. The decreasing of rates are probably due to several factors such as improved hygiene, sanitation, changings in policies (a better management of hospital admissions), socio-economic conditions and increased of food-safety measures.

Role and outputs: *co-investigator*

Maintained contact with National Public Health Institute (ISS) to receive the Italian database, adapted the do-file to Italian database, performed data cleaning and data analysis. The project is still on-going.

Supervisor(s): *Johan Giesecke, Ettore Severi and Domenico Martinelli*

Further activities: Planning to submit a manuscript to a peer-reviewed journal in the near future

Competencies developed:

By being involved in this interesting project I had the opportunity to work together with other EPIET colleagues, sharing knowledge and opinions and contributing in measuring health outcomes, which I hope will influence decision making on the future policy on Hepatitis A in Europe. Through this project, I further developed my statistical skills using STATA and I became aware of the differences between health systems among participating European countries.

4. Communication

Publications in peer reviewed journals

1 manuscript as first author (7)

Manuscripts submitted to peer reviewed journals (in review process)

We submitted the draft of the manuscript (short report) "*Evaluation of the Italian integrated measles and rubella surveillance system in Apulia region, three years after its introduction*", to Epidemiology and Infection Journal where I am the first author (4)

Conference presentations

4 posters presented in conferences at ESCAIDE 2016 (3, 8), ESCAIDE 2017 (2) and at the National Congress of the Italian Society of Hygiene, Turin, Italy, 22-25 November 2017 (10)

1 oral presentation at the National Congress of the Italian Society of Hygiene, Napoli, Italy, 7-11 November 2016 (6)

Reports

1 outbreak reports (9) and 3 surveillance report (1, 2, 4)

Other

- 1 risk assessment (5)
- Translated and adapted in Romanian of a questionnaire for TB patients: *Evaluation of determinants of delay in access to health services, diagnosis and treatment of pulmonary tuberculosis (PTB) in vulnerable populations. Evaluation of the Impact on Local Epidemiology and Prevalence of Resistance / Multi-Resistance to Antitubercular Drugs*
- Collaborated in adaptation for dissemination at regional and local level of several ministerial documents on surveillance of arbovirosis

5. Teaching activities

Course on "Outbreak Investigation"

Developed and held in Italian a course on "Outbreak Investigation" with 3 modules (9 hours). Each module included a theoretical (lecture) and a practical part (case study). Target audience were 9 medical resident doctors in their first and second year of postgraduate specialization in Hygiene and Preventive Medicine, from the University of Bari "Aldo Moro" working at the Hygiene Department of the Bari's Policlinic. I used a power point presentation for the lectures and also prepared back-up slides to give more information on the subjects of the case studies.

At the end of the third module, all participants received and completed a "course satisfaction questionnaire", to evaluate the course.

Lecture on Outbreak Investigation (2 hours) – held on 16 May 2016

Learning objectives: at the end of this lecture, the participants will be familiar with the definition of the terms outbreak, epidemic, endemicity, cluster and pandemic, discuss reasons that outbreaks occur, state what a line listing is and what it is used for, understand the rationale for investigating outbreaks and describe the 10 steps of an outbreak investigation.

Moderation of case study (1 hour): "*Trichinellosis outbreak in France*"

Lecture on Outbreak Investigation (2 hours) – held on 23 May 2016

Learning objectives: at the end of this lecture, the participants will be familiar with how to build a case definition, define hypothesis, use of time, place & person to formulate hypothesis, interpret an epidemic curve and recognize different types of epidemic curves and know where to find the clues for determining 1) disease, 2) route of exposure, and 3) population at risk .

Moderation of case study (1 hour): "*An outbreak of gastrointestinal illness following a christening party*".

Lecture on Outbreak Investigation (2 hours) – held on 24 May 2016

Learning objectives: at the end of this lecture, the participants will be able to understand the concepts of descriptive and analytic epidemiology, define and recognize different types of epidemiological studies, strengths and limitations of cohort, case-control, cross-sectional studies, and understand approaches to selecting a comparison group(s)- recognize a confounder and an effect modifier.

Moderation of case study (1 hour): "*Outbreak of gastroenteritis, Sweden*".

Course evaluation: All students returned a completed evaluation form, using scores from 1 to 5 (1=completely disagree, 5= completely agree). The mean score of the course was 4.6.

The participants gave mean scores from 4.7 to 4.9 for the overall effectiveness of the speaker' teaching, the way in which the speaker directed and stimulated the discussion, the appropriate balance between instruction and practice, the organized manner in which was presented the content of the course, the way in which the speaker encouraged participants question and gave answers.

Lower mean scores of 4.3 and 4.5 were given for the ability of the speaker to present the course content in Italian and they felt that they needed more explanation on understanding the course' case studies.

Lecture on "Evaluation of surveillance systems"

Developed in Italian a **Lecture on evaluation of surveillance systems** - (1 hours) and prepared **practical exercises on interpretation of surveillance data** (1 hour). The lecture (PowerPoint) and exercises are part of a course on surveillance that will take place on 11 September 2017.

Learning objectives: at the end of this lecture, the participants will be familiar with the definition of a surveillance system, why and when a surveillance system should be evaluated (purpose), steps to evaluate a surveillance system (describe the system, evaluate planning, evaluate, propose an action plan), what are the qualitative and

quantitative attributes of surveillance system, discuss ways to evaluate attributes, example of an surveillance system evaluation.

Target audience will be medical resident doctors in their first, second and third year of postgraduate specialization in Hygiene and Preventive Medicine, from the University of Bari "Aldo Moro" working at the Hygiene Department of the Bari's Policlinic. At the end of the training, all participants will receive a "course satisfaction questionnaire", to evaluate the training.

Supervisor(s): *Domenico Martinelli* (for the outbreak investigation course) and *Francesca Fortunato* (for the lecture and exercises on surveillance)

Educational outcome:

It was a great and challenging experience for me since I had develop the course in English and Italian and to deliver it and moderate all the case studies in Italian. I liked being in the position of the teacher, helping students understand the concepts of epidemiology, adapting the presentation from one module to another to suit their level of knowledge and needs, preparing extra materials and replying to their questions. Developing and delivering these teaching assignments helped me consolidate and clarify epidemiologic notions previously learned in order to deliver a good lecture to the audience.

Other activities

Additional training

1. **Scientific Abstract Writing**- ECDC on-line course, 4 January to 1 March 2016
2. **Basic Security in the Field II** and **Advance Security in the field**, United Nations Department of Safety and Security (UNDSS) online courses, **certificates aquired** on 4 October 2016 and 6 October 2016
3. **Antibiotic Resistance** e-learning course, 15 February 2017 to 5 March 2017, Uppsala University, Sweden
4. **Integrated Disease Surveillance and Response** (IDSR), e-learning course, 27. April to 5 May 2017, World Health Organisation (**certificate aquired**)
5. **Immunization coverage data**- on-line course World Health Organisation (on-going) July 2017

6. EPIET modules attended

1. Introductory Course, 28 September to 16 October 2015, Spetses, Greece
2. Outbreak investigation module, 7 December to 11 December 2015, Berlin, Germany
3. Multivariable Analysis module, 14 March to 18 March 2016, Vienna, Austria
4. Rapid Assessment and Survey methods module, 20 June to 26 June 2016, Athens, Greece
5. Project Review module, 22 August to 26 August 2016, Lisbon, Portugal
6. Time-Series Analysis module, 7 November to 11 November 2016, Bucuresti, Romania
7. Vaccinology module, 12 June to 16 June 2017, Stockholm, Sweden
8. Project Review module, 28 August to 1 September 2017, Lisbon, Portugal

Supervisor's conclusions

The fellow was involved in the most significant activities of the Site, Sector of Hygiene, University of Foggia, Italy. Since the begging of the fellowship, she was included in the activities of routine surveillance of infectious diseases in Puglia region, starting with the surveillance of the vector borne and zoonotic diseases. Progressively, she gave her

substantial contribution in surveillance producing data analysing and report, as in the case of the time-series descriptive analysis of eight vaccine preventable diseases published on the web site of the Regional Observatory for Epidemiology. She evaluated the integrated surveillance system for measles and rubella in Apulia region three years and a half after its introduction, producing a report and a paper now submitted to a peer-review scientific journal. She investigated an outbreak of a human Trichinosis occurred in Manfredonia, a small town in the province of Foggia. The outbreak investigation report was published as a letter to the Editor of a peer-review Journal. In terms of research, the fellow wrote the protocol, finalized the data analysis and drafted an article on the retrospective analysis of national hospitalizations for Herpes Zoster in Italy in the period 2001-2012. Moreover, she was involved in the research titled "Has hepatitis A severity increased in the EU in the last 20 years?" promoted by the ECDC. She organized, prepared the material and held a three session course (three hour/ session) on the theme "Outbreak Investigation" that included a theoretical (lectures) and a practical part (case studies). In addition to the abstracts presented to ESCAIDE, the fellow submitted a contribution to the annual Congress of Italian Society of Hygiene and Preventive Medicine that was accepted as an oral communication.

Coordinator's conclusions

During the two-year fellowship Iulia has taken part in the day-to-day work at the Department of Medical and Surgery Science, Faculty of Medicine from the University of Foggia. Iulia has developed projects in the area of vaccine preventable diseases from epidemiological description of surveillance data, evaluation of systems, analysis of economic burden, and rapid risk assessment. Through these projects Iulia became acquainted with national and European surveillance systems and WHO recommendations showing a great capacity of identifying and putting together all the necessary information to complete the assignments. She had the opportunity to be involved in an international project on severity of hepatitis A analysing the data available in Italy and being in close collaboration with colleagues from other countries and from ECDC. Iulia has proven that she can adapt to different working cultures and environments, she has shown a great interest in understanding the operational procedures in national surveillance, and as coordinator I can guarantee that Iulia is a committed professional.

Personal conclusions of fellow

Over the last two years, the programme has provided me with the opportunity to work on regional and international level and it allowed me to develop statistical skills, enrich analytical skills and gaining more experience in Public Health area from a different perspective.

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2. Iulia Adelina Turiac, F. Fortunato, M. G. Cappelli, R. Prato, D. Martinelli, *Evaluation of the Italian integrated measles and rubella surveillance system in Apulia region, three years after its introduction*. Submitted for publication to *Epidemiology and Infection Journal* (under revision). Poster will be presented at ESCAIDE 2017, Stockholm, Sweden
3. Francesca Fortunato, M. G. Cappelli, I. A. Turiac, D. Martinelli, R. Prato, *Effectiveness of acellular pertussis vaccination in children twenty years after its introduction in Italy*, ESCAIDE, 27-30 November 2016, Stockholm, Sweden
4. Iulia Adelina Turiac, Domenico Martinelli, Maria Giovanna Cappelli, Giovanni Caputi, Giulia Del Matto, Francesca Fortunato, Rosa Prato, *Progress of the notified vaccine preventable diseases: hepatitis A, hepatitis B, measles, rubella, pertussis, varicella, mumps, and meningococcal meningitis in Apulia region, 1996-2015*. Published on the Apulian Regional Observatory for Epidemiology website. Available at: <https://www.sanita.puglia.it/web/oer/malattie-infettive>
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7. Iulia Adelina Turiac, Maria Giovanna Cappelli, Rita Olivieri, Raffaele Angelillis, Domenico Martinelli, Rosa Prato, Francesca Fortunato, *Trichinellosis outbreak due to wild boar meat consumption in southern Italy*, letter to the editor, *Parasites and Vectors Journal*, Published: 28 February 2017. Available at:
<https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-017-2052-5>
8. Iulia Adelina Turiac, Francesca Fortunato, Maria Giovanna Cappelli, Rosa Prato, Domenico Martinelli, *Retrospective analysis of national hospitalizations for Herpes Zoster, Italy 2001-2012*; ESCAIDE, 27-30 November 2016, Stockholm, Sweden
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10. Giulia Del Matto, Francesca Fortunato, Maria Giovanna Cappelli, Iulia Turiac, Anna Morea, Maria Chironna, Domenico Martinelli, Rosa Prato, *Casi di epatite A tra men who have sex with men in Puglia: risk assessment gennaio - giugno 2017*, National Congress of the Italian Society of Hygiene, Turin, Italy, 22-25 November 2017